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## **In flight Validation of Thermal Infrared Data over Land**

Simon J. Hook<sup>1</sup> and Ali Abtahi<sup>2</sup>

Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California 91109

Tel: 818-354-0974<sup>1</sup>

Tel: 818-354-0766<sup>2</sup>

Fax: 818-354-0966

Email: [Simon.J.Hook@jpl.nasa.gov](mailto:Simon.J.Hook@jpl.nasa.gov)

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### **Abstract**

In 1998 NASA's first Earth Observation System platform will be launched into earth orbit. Five instruments are mounted on the platform including the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Advanced Spaceborne Thermal Emission Reflectance Radiometer (ASTER). MODIS has 36 spectral channels between 0.4 and 14  $\mu\text{m}$  and ASTER has 14 spectral channels between 0.5 and 12  $\mu\text{m}$ . The data from these spectral channels will be used to produce a set of standard data products that will be made available to the scientific community. The standard products include several derived from the data acquired in the thermal infrared channels such as radiance at sensor, radiance at surface, surface temperature and surface emissivity. It is essential that these products are validated to ensure the instruments and the standard product algorithms are functioning correctly.

In-flight validation of thermal infrared data is well established. Currently, this involves mounting validation campaigns in which researchers from several institutions make various ground and atmospheric measurements. The data from these campaigns are then used to propagate the surface radiance through the atmosphere to derive a radiance that can be compared directly with the radiance derived by the satellite- or aircraft- mounted sensor. In addition, the satellite- or aircraft derived sensor radiance can be compensated for atmospheric effects, using the data acquired in the campaign, to derive a surface radiance, temperature or emissivity that can be compared with the corresponding parameter measured on the surface. The primary difficulty with this validation approach for ASTER and MODIS is that it will probably result in a very limited number of seasonally restricted validation datasets. This difficulty arises for three reasons. First it is extremely difficult to mount large campaigns on a regular basis throughout the year. Second the orbit configuration of the ASTER instrument only allows the same area to be imaged every 16 days. Third the season with the greatest chance of resulting in cloud-free

data over the validation site must be selected in order to maximize resource use. In order to address these limitations we are instrumenting a small number of sites to automatically obtain a basic set of validation data, under a range of atmospheres, throughout the year. The sites selected are L. Tahoe ~~CA~~, USA, Hay, NSW, Australia, Amburla, NT, Australia and Broome, Western Australia. Some of the sites are currently utilized for the semi-annual validation campaigns and these would provide an opportunity to supplement the basic validation parameters with additional field and airborne measurements.

Validation will involve comparison of the surface geophysical standard products with the ground measurements as well as propagation of the ground measurements through the atmosphere for comparison with the at sensor radiance. The necessary instrumentation is currently being deployed at the validation sites including several accurate and precise thermal infrared radiometers. In the case of L. Tahoe the radiometers will be mounted on buoys and the data transmitted to shore. We will discuss the instrumentation at each site and present some preliminary results from the new thermal infrared radiometers.

The basic validation data will be made available on the World Wide Web (WWW) and will be suitable for validating data from other EOS instruments, e.g. the thermal infrared channel of Landsat 7. The field instruments will be periodically calibrated at the thermal infrared calibration facilities at the Jet Propulsion Laboratory and the Ames Research Center. The calibration data will also be made available on the WWW.

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### **Biography**

Simon J. Hook holds a BSc in geology from the University of Durham, England, an MSc in geology from the University of Alberta, Canada and a PhD in geology from the University of Durham, England. After completing his PhD he undertook a two year National Research Council, Resident Research Associateship at the Jet Propulsion Laboratory, Pasadena, California. He is now employed as the U. S. Project Scientist for the Advanced Spaceborne Thermal Emission Reflectance Radiometer (ASTER) at the Jet Propulsion Laboratory.

## **100 Word Abstract**

In 1998 thermal infrared data from two instruments on-board the EOS-AM1 platform will become available. These data will be used to produce several standard data products. These products will be validated, in part, using a small number of sites that are being instrumented to automatically obtain a basic set of validation data, under a range of atmospheres, throughout the year. The sites selected are L. Tahoe-~~CA~~, USA, Hay, NSW, Australia, Amburla, NT, Australia and Broome, Western Australia. ~~100~~

We will discuss the instrumentation at each site and present some preliminary results from a new portable, accurate and precise thermal infrared radiometer developed for the project.